Bellwork: 4/5/13
Simplify the following expression:

LCD: $(x-4)(x+3)(x+1)$

$$\frac{4x}{x^2-x-12} - \frac{x+2}{x^2-3x-4} =$$

$(x+3)\boxed{(x-4)} \mid \boxed{(x-4)}(x+1)$

FOIL

$$\frac{4x(x+1)}{(x+3)(x-4)(x+1)} \quad -1\frac{(x+2)(x+3)}{(x-4)(x+1)(x+3)}$$

$4x^2+4x-1(x^2+5x+6)$

$\cancel{4x^2}+\cancel{4x}-\cancel{x^2}-\cancel{5}x-6$

$$\frac{3x^2-x-6}{(x-4)(x+3)(x+1)}$$

ALGEBRA 2 NAME __________________
NOTES 8.4 - Part 3 PERIOD __________________

SOLVING EQUATIONS INVOLVING RATIONAL EXPRESSIONS

The ***best*** way to solve an equation involving fractions is to clear the equation of fractions. This can be done by *multiplying* ***each term*** *by the* ***LCD***.

LCD: $3 \cdot 4 = 12$

Example 1: $\frac{x}{3}+\frac{3x}{4}=\frac{2}{1}$

$$\frac{x\cdot 4}{3\cdot 4}+\frac{3x\cdot 3}{4\cdot 3}=\frac{2\cdot 12}{1\cdot 12}$$

$4x+9x=24$

$\frac{13x}{13}=\frac{24}{13}$ $\boxed{x=\frac{24}{13}}$

LCD: $5\cdot 3=15$

Example 2: $\frac{2x}{5}-\frac{2}{3}=\frac{4x}{15}+\frac{1}{5}$

$5\cdot 3$

$$\frac{2x\cdot 3}{5\cdot 3}-\frac{2\cdot 5}{3\cdot 5}=\frac{4x}{15}+\frac{1\cdot 3}{5\cdot 3}$$

$6x-10=\cancel{4x}+3$
$-4x \qquad\qquad \cancel{-4x}$

$2x-\cancel{10}=3$
$\;\;\;\;\cancel{+10} \quad +10$

$\frac{\cancel{2}x}{\cancel{2}}=\frac{13}{2}$ $\boxed{x=\frac{13}{2}}$

Recall: Division by 0 is undefined!! (Zero cannot be in the denominator.)

Therefore, whenever a rational expression contains a ***variable in the denominator***, it is first necessary to ***eliminate any values that would make the denominator equal to 0***. To find the values that should be eliminated, called ***restrictions***, factor each denominator and then set each different factor of the denominators equal to 0 and solve for x.

Example 3: $\frac{1}{x-2} = \frac{3}{x+2} - \frac{6x}{x^2-4}$

LCD: $(x+2)(x-2)$

$(x-2) \quad (x+2) \quad (x+2)(x-2)$

Restrictions:

$x-2=0 \quad x+2=0$

$x=2 \quad -2 \; -2$

$x=-2$

$x \neq$ 2, -2

$$\frac{1(x+2)}{(x-2)(x+2)} = \frac{3(x-2)}{(x+2)(x-2)} - \frac{6x}{(x+2)(x-2)}$$

$$x+2 = 3x-6-6x$$

$$x+2 = -3x \cancel{-6}$$

$$+6 \qquad \cancel{+6}$$

$$\cancel{x}+8 = -3x$$

$$\cancel{-x} \qquad -x$$

$$8 = -4x$$

$$\frac{8}{-4} = \frac{-4x}{-4}$$

$$x=-2$$

NO SOLUTION!

The solution appears to be –2. However, -2 is a restricted value because it would make at least one of the denominators of the original equation zero. Therefore, this solution must be eliminated which means that this equation has ***no solution***.

$x \neq$ 2, -2

$x =$ ~~-2~~ no solution!

Example 4: $\frac{x}{x-1} + x = \frac{4x-3}{x-1}$

LCD: $x-1$

Restrictions:

$x-1=0$

$x=1$

$x \neq 1$

$$\frac{x}{(x-1)} + \frac{x(x-1)}{1(x-1)} = \frac{4x-3}{(x-1)}$$

$$\cancel{x} + x^2 \cancel{-x} = 4x-3$$

$$x^2 = 4x-3$$

$$-4x+3$$

$$x^2-4x+3=0$$

$$(x-3)(x-1)=0$$

$$x-3=0 \quad x-1=0$$

$$x=3 \quad \cancel{x=1}$$

$$\boxed{x=3}$$

A simple rational equation in for which each side of the equation is a ***single rational expression*** can be solved by using Cross Multiplication.

Example 5: $\frac{2}{x-3}=\frac{3}{x+1}$

Restrictions:
$x-3=0 \quad x+1=0$
$x=3 \quad x=-1$
$x\neq 3,-1$

LCD: $(x-3)(x+1)$

$$\frac{2(x+1)}{(x-3)(x+1)}=\frac{3(x-3)}{(x+1)(x-3)}$$

$$2x+2=3x-9$$
$$-2x \qquad -2x$$
$$2=x-9$$
$$+9 \qquad +9$$
$$\boxed{11=x}$$

⑤ $\frac{5}{(x+2)}=\frac{5}{\boxed{x}}+\frac{2}{3x}$

LCD: $3x(x+2)$

$3x=0$, $x+2=0$
$x=-2$
$x\neq 0,-2$

$$\frac{5\cdot 3x}{(x+2)\cdot 3x}=\frac{5\cdot 3(x+2)}{x\,3(x+2)}+\frac{2(x+2)}{3x(x+2)}$$

$$15x=15x+30+2x+4$$

$$15x=17x+34$$
$$-17x \qquad -17x$$

$$-2x=34$$
$$\boxed{x=-17}$$

Classwork: packet pgs 5+6
all

$x = 0$

$x \neq 0$